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PRESENT AND FUTURE PROSPECTS OF AGROFORESTRY AS PERCEIVED BY FARMERS IN PUNJAB, PAKISTAN

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Abstract: *Pakistan is included in those countries which have very low forest cover. Forests contribute 2.11% of total land area in Pakistan. Privately or communal ownership, state ownership are the ways in which forests are established. In 2009, the contribution of forests remained 205 thousand cubic meters for firewood and 83 thousand cubic meters for timber. Agroforestry is the growing of trees and shrubs on farm and pasture lands. Agroforestry emerged in late 1970s as an improved and modern land use system. The present study was conducted in Tehsil(Sub-District level) Noor Pur, District Khushab. Out of 10 union councils (2 urban and 8 rural) of TehsilNoor Pur,five rural union councils (each U.C consists of 6-8 villages) were selected through simple random sampling. From each selected union council, two villages were randomly targeted to select the sample respondents. From each selected village, 12 respondents (who practice agroforestry on their farms) were selected as sample for the study, thereby making a total sample of 120 respondents. The data wereobtained through a well-structured interview schedule. The collected data were analyzed with the help of Statistical Package for Social Sciences (SPSS) for deriving conclusions and formulating recommendations. The results showed that majority of the respondents grewEucalyptus camaldulensis(Local name:Sufeda) on their farmlands to get economic benefits and wanted to increase number of Eucalyptus camaldulensis (sufeda) trees on their farms. On the basis of conclusions it was suggested that the Government should provide incentives and proper training to the farmers practicing agroforestry.*

Keywords: Agroforestry, Prospects, Constraints, Economic, Benefits.

I. INTRODUCTION

Forests play an important role in the existence of living organisms on the earth. Forests' role cannot be neglected in agricultural and environmental status of any country. There are different ways in which forests are playing an

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important role; reduction of soil erosion, provision of habitat for animals and population and regulation of precipitation and stream flows. Medicines, non-timber and timber products and food are obtained from forests.

The contribution of forests remained 262 thousand cubic meters of firewood and 92 thousand cubic meters of timber during the year 2011-12 while in 2010-11 this contribution was 261 thousand cubic meters in firewoodand 91 thousand cubic meters in timber. Forest area showed an increase of 1% over the last year (Govt. of Pak., 2011-12)[1]. While world's forests cover an area of 30% (FAO, 2009)[2]. Total forest area of different provinces and territories of Pakistan viz. Sindh, Baluchistan, Punjab, Khyber-Pakhtoonkhwa, Azad Kashmir and Northern areas is 0.92, 0.33, 0.69, 1.21, 0.42, and 0.66 million hectares, respectively (Govt. of Pak., 2009)[3].

In Pakistan requirements of wood are greater than the total wood production per annum Farmland contribute in 60% timber production and 90% in fuel wood. Thus farm forestry plays a very important role in fulfilling our wood requirements. Only 2% of the area is under forest cover with agricultural crops. It has been estimated that without harming agricultural crops, 10% area of our farmland can be easily used for forest cover. Thus, our growing needs of wood products can be fulfilled only by practicingagroforestry (Qureshi, 2002)[4].

Pakistan is included in those countries which have very low forest cover. Forests contribute 2.11% of total land area in Pakistan (World Bank, 2011)[5]. Of this total forest area, commercial forest is just one-third (32.8%) and the rest (67.2%) is under protected forest, performing climatic functions, soil conservation and watershed protection. By the year 2015 Pakistan is willing to have an additional area of 1.051 million hectares under forest from existing about 5 to 6% (Govt. of Pak., 2008)[6].

Pakistan's economy has major concern with forests as they play a vital role in its development. Fuel wood, fodder, timber and shelter for livestock are the output obtained from forests. During the last two decades the significance of wood produced on farmlands has increased sharply(Nouman*et al*., 2006)[7]. Agroforestry is the growing of trees and shrubs on farm and pasture lands. Farmers manage trees to increase the availability of on-farm wood products and energy sources, to produce livestock forage and to improve agricultural soils to enhance food production (NSW, 2003)[8]. Various plantations of different species on farmlands can be raised for timber, fodder, food and fuel wood. There are several other ways of raising of such type of plantations outside the forests on wastelands such as; canal sides, agriculture fields and railway tracks (Kausar,1989)[9]. Agroforesty emerged in late 1970s as an improved and modern land use system. Agroforestry science spans the disciplinary spectrum from the biological and physical sciences to the social science like the traditional land-use discipline of agriculture and forestry (Mercer, 1993)[10]. Agroforestry is being promoted in the USA as it help in bringing suitable changes in environment such as reduction in soil erosion, better water quality and habitat for wildlife. Providing economic benefit to farmer was also a purpose of promoting agroforestry in USA. For growing different species of trees the extension worker, land owner and farmers should be fully informed (Ellis *et al*., 2000)[11]. The main problems of small farmers in Nigeria were that the farmers growing food crops had more facilities as compared to other farmers. There was also a lack of coordination between farmers and foresters. Insufficient information about the farmers' social and economic behavior was also a barrier in adoption of agroforestry. The farmers wanted to grow trees on their farmlands because there were greater advantages in growing trees (Osemeobo,1990)[12].The reasons for planting trees and the species selected by farmers for their farmlands were also studied by Saxena (1990)[13]. From his study he observed that additional income from sale of timber and fuel wood was the major reason of farmers for planting different species of trees on their farmlands. Income generation was the main reason for planting trees of 70% among large farmers, while this was main reason for 54% of small farmers. This trend was further shown in the species planted by farmers. *Eucalyptus camaldulensis* was the major tree grown in a majority of villages and it contributed about 84% of the total trees planted. It was also seen that all villages had mango plantation. Some other species were also grown by farmers which had local importance such as sheesham (*Dalbergiasissoo*), poplar (*Populus deltoids)*,mahua (*Modhucaindica*) and babul (*Acacia nilotica*). Other reasons indicated for growing trees were that the farmers wanted to protect their crops from the damages of the neighbors.Bukhari

(1997)[14] in his study reported that there are many advantages in adopting agroforestry as trees help in improving soil fertility. Environmental quality also becomes good by practicing agroforestry. Trees also help by protecting watersheds which contribute to economic development. Government policies and academic literature is not supporting agroforestry that's why uptake has been lower. However the farmers are desired to grow trees on their farms. Focus of forestry research and education is on the technical forestry and forestry services in which staff needs are fulfilled. In projects there is lack of farmers' participation. He suggested that to improve agroforestry we should make possible the participation of people for growing trees on their farmlands.

Khan (1997)[15] also discussed the constraints of the farmers that the small landholding and income discouraged the adoption of agroforestry practices however the farmers wanted to practice the agroforestry on their farmlands. There was not regular use of fertilizers and chemicals. High costs and lack of knowledge were the main constraints in adoption of fertilizers and chemicals.To evaluate the attitude, role and perceptions of the farmers in growing trees on their farms. It was concluded that major factor in promoting agroforestry was the availability of land. Due to presence of different discouraging factors the farmers think trees as crop of barren land. These factors were lack of nurseries and low market facilities. The research reported here suggests that the policy makers should present such policies which would be helpful to farmers for growing trees on their farms putting in mind the problems related to marketing, the perception of agroforestry as long term business, damage to seedling by animals and humans and lack of nurseries (Zubair and Garforth, 2005)[16]. Some other factors were also responsible for growing trees along with the crops. Agroforestry is helpful to them for sustainability of their livelihoods, maintenance of their socio-economic needs and reduction of poverty (Rahman*et al.*, 2008)[17].

II. MATERIALANDMETHODS

Tehsil(Sub-District level) Noor Pur served as the universe of the study. Out of 10 union councils (Each union council consists of 6-8 villages), 5 urban union councils were selected at random. From each selected union council, two villages were selected randomly. From each selected village, 12 farmers were selected thus making a total of 120 farmers as sample for the study. A well-structured interview schedule was developed to collect the data, which was pre-tested and necessary changes were made accordingly. The collected data was statistically analyzed with the help of Statistical Package for Social Sciences (SPSS) and interpreted to draw conclusions and to make recommendations.

III. RESULTSANDDISCUSSION

The general objective of the present study was to determine the present and future prospects of agroforestry in Tehsil(Sub-District level) Noor Pur, District Khushab. Analysis and interpretation of data are the most important steps in scientific research.

Table-1. Distribution of the respondents according to their source of information about agroforestry

Source of information	**No.**	**%**
Radio	2	1.7
Television	53	44.2
Printed material	4	3.3
Forest department	3	2.5
Neighborfarmers	97	80.8

N = 120

Data in Table 1 reveal that source of information of a large majority (80.8%) of the farmers was neighbor farmers. Less than half (44.2%) of the respondents reported that they got information from television. Only 3.3% of the respondents mentioned that their source of information was printed material. This may be due to the reason that mostly the farmers follow the trends. The results were more or less similar to Younis (2010)[18] who reported that sources of information of mostly farmers were neighbor farmers, printed materials and Forest Department.

Table-2. Distribution of the respondents according to type of plantation they have on their farmland and what is their future plan.

Present status				**Expansion**		**Reduction**		**No change**	
Eucalyptus camaldulensis (Sufeda)	**No. of plants**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
	Up to 50	23	19.2	73	60.8	23	19.2	24	20.0
	51-100	78	65.0						
	100+	19	15.8						
	Total	120	100.0						
Dalbergiasisso (Sheesham)	Up to 50	81	67.5	1	0.8	74	61.8	12	10.0
	51-100	6	5						
	Total	87	72.5						
Acacianilotica (Kikar)	Up to 10	11	9.2	-	-	9	7.5	5	4.2
	11-30	3	2.5						
	Total	14	11.7						
Populus deltoids (Poplar)	Up to 10	9	7.5	-	-	6	5.0	3	2.5
	11-20	0	0						
	Total	9	7.5						
Meliaazedarach (Bakain)	Up to 10	72	60.0	13	10.8	39	32.5	42	35.0
	11-30	22	18.3						
	Total	94	78.3						
Tamarixaphylla (Frash)	Up to 50	44	36.7	53	44.2	17	14.2	50	41.7
	51-100	71	59.2						
	100+	5	4.1						
	Total	120	100.0						
Bomboxceiba (Sumbal)	Up to 10	3	2.5	3	2.5	9	7.5	4	3.4
	11-20	11	9.2						
	20+	2	1.7						
	Total	16	13.4						

About one forth (19.2%) of respondents had grown up to 50 *Eucalyptus camaldulensis* (sufeda) plants and about one fifth (19.2%) of the respondents were in favor of reduction in *Eucalyptus camaldulensis*(sufeda) plants.

A good majority (67.5%) of respondents had grown up to 50 *Dalbergiasissoo*(sheesham) trees and majority (61.67%) 0f the respondents were in favorof reduction in *Dalbergiasissoo*(sheesham)plants.

Less than half (44.2%) of the respondents were in favor of expansion of*Tamarixaphylla* (frash) trees. About 37% of the respondents had grown upto 50*Tamarixaphylla*(frash) trees. A few (14.2%) of them indicated that there should be reduction in its plantation while 41.7% of them were in favor of no change in its plantation.

Eucalyptus camaldulensis(sufeda) was planted by most of the farmers because it was more economical from sale of timber and the farmers wanted to increase their income. These results are more or less similar to those ofSexena (1990) who reported that *Eucalyptus camaldulensis*(sufeda) was planted by majority (84%) of the respondents.

Table-3. Distribution of the respondents according to their purpose of using trees.

Purpose	**No.**	**%**
Fuel	53	44.2
Wind breaker	4	3.3
Soil fertility	23	19.2
Fodder purpose	104	86.7
Economic benefit	118	98.33
Agricultural implements	13	10.8

(Table 3)

Economic benefit and fodder purpose was main purpose of practicing agroforestry reported by 98.33 and 86.7% of the respondents respectively because the farmers have not proper source of income to meet their and animals needs as well. Other purposes for using trees were fuel (44.2%), soil fertility (19.2%), agricultural implements (10.8%) and wind breaker (3.3%). These results are more or less similar to those of Sexena (1990) who stated that additional income from sale of timber and fuel wood was the major reason of farmers for planting different species of trees on their farmlands. Income generation was main reason for planting trees of 70% among large farmers, while this was main reason for 54% of small farmers. The results are also more or less similar to those of Wasteland News (1994)[19] who reported that fuel wood and agricultural implements were the major purpose of growing trees.

Table-4. Mean, standard deviation, weighted score and rank order of trees on the basis of profitability level

Trees Scientific name (Local name)	**Rank**	**Weighted score**	**Mean**	**SD**
Tamarixaphylla(Frash)	1	533	4.4	0.8
Eucalyptus camaldulensis(Sufeda)	2	529	4.4	0.8
Dalbergiasissoo(Sheesham)	3	435	3.6	1.0
Meliaazedarach (Bakain)	4	275	2.3	0.6
Bomboxceiba (Sumbal)	5	249	2.1	0.7
Acacianilotica (Kikar)	6	229	2.0	0.7
Populus deltoids (Poplar)	7	175	1.5	0.6

It is evident from the data given in Table-4 that *Tamarixaphylla* (frash), *Eucalyptus amaldulensis*(sufeda) and *Dalbergiasissoo* (sheesham) were ranked 1st, 2nd and 3rd. They fell between high and very high category but inclined towards high category with mean values 4.44, 4.41 and 3.63 respectively on the basis of profitability. Bakain, sumbal and kikar were in between low and medium category but inclined towards low category having mean values 2.29, 2.08 and 2.0 respectively. On the basis of profitability, mean value of *Populus deltoids*(poplar) (1.46) showed that it inclined towards very low category. The respondent's inclination towards*Tamarixaphylla*(frash), *Eucalyptus camaldulensis* (sufeda) and *Dalbergiasissoo*(sheesham) may be due their timber importance and fuel wood purpose for their home and for sale.

3.1. Constraints Faced by the Respondents in Tree Plantation

There may be many constraining factors which hinder the adoption of agroforestry. It was therefore, thought necessary to identify the constraints so that necessary solutions may be suggested. So respondents were asked to report the problems and constraints faced by them in practicing agroforestry on their farmlands. Table 5 indicates the hindrances faced by the farmers in the adoption of agroforestry.

Table-5. Distribution of the respondents according to the constraints faced by them in tree plantation

Constraints	No.	%
Lack of education	71	59.2
Lack of technical skills	103	85.8
Lack of capital	45	37.5
Non-availability of plants	3	2.5
Lack of information	77	64.2
Lack of technical assistance	110	91.7
Lack of marketing facilities	13	10.8
Lack of transportation	27	22.5
Lack of wood-based industries	90	75.0
Water shortage	118	98.3

N = 120

It is evident from Table 5 that an overwhelming majority (98.3%) of the respondents showed that water shortage was their main problem in tree plantation due to non-availability of canal irrigation water. Majority (91.7%) of the respondents viewed that lack of technical assistance was also a major problem in tree plantation as the extension worker does not take interest in assisting them. The other constraints faced by the respondents were lack of technical skills (85.8%), lack of wood based industries (75.0%), lack of information (64.2%), lack of education (59.2%), lack of capital (37.5%), lack of transportation (22.5%), lack of marketing facilities (10.8%) and non- availability of plants (2.5%). The results were more or less similar to those of Race and Curtis (1996)[20] who studied that the farmers faced some barriers in tree plantation such as capital availability. The results were also more or less similar to those of Khan (1997) who stated that availability of income and lack of knowledge were the main constraints in adoption of agroforestry.

IV. ConclusionsandRecommendations

From above discussions it was concluded that neighbor farmers were the main source of information in practicing agroforestry. Main purpose of practicing agroforestry was to get economic benefits and that was the reason that majority of the respondents had grown *Eucalyptus camaldulensis*(sufeda) on their farmlands. On the basis of conclusions it was recommended that the Government should take serious steps to promote agroforestry and the farmers practicing agroforestry should be given proper trainings. There is dire need to establish wood-based industries to meet the needs of farmers.

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